Advanced Operating Systems Lecture notes

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Administration

- Instructors
  - Dr. Dongho Kim
  - Dr. Tatyana Ryutov
- TA
  - Chansook Lim
- Office hours
  - Drs. Kim and Ryutov
    - Friday 11a.m. to noon
  - Chansook Lim
    - Wednesday 10a.m. to 11a.m. (regular)
    - Monday 10a.m. to 11a.m. (optional -needs notice in advance)

Administration

- Class Home Page
  http://gost.isi.edu/courses/usc_csci555.html
  - Announcements
  - Syllabus
  - Lecture Slides
  - Reading list
- Class e-mail: csci555@usc.edu

Administrative Information

- Reading list
  - ~65 papers and
  - ~20 book chapters
  - Concentrated toward the first half
- Text
  - Distributed Systems: Concepts and Design (third edition)
    - By Coulouris, Dollimore, and Kindberg

Administrative Information

- Assignments
  - 4 Reports,
    - Due 11 p.m. Thursday nights
  - Research Paper
    - Due: last class
  - Exams
    - Mid-Term: Friday, October 15
    - Final Exam: Friday, December 10

Administrative Information

- DEN site - Blackboard
  - Lecture webcast
  - Class forum
  - Grades
- Lecture notes to be posted by Thursdays before lecture
- Academic Integrity
  - READ IT – It applies to you

Administration

- Class forum
  - Announcements
  - Questions
  - Answers
  - Registration
  - Participation

http://den.usc.edu

Administration

- Grading
  - 20%: Reading Reports
  - 20%: Midterm
  - 20%: Final
  - 30%: Research Paper
  - 10%: Class Participation (quiz)

How to survive?

- Read the survival guide
- How to read papers
  - Read the papers in advance
    - Be critical
  - At least skim through
- Build your own notes
- Study group

CSci555: Advanced Operating Systems

Lecture 1 – August 27, 2004

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What you should learn in this course

- You will gain a basic understanding of distributed system concepts.
- You will develop intuition for which approaches work, and which don't.
- You will develop the ability to sense where bottlenecks lie in system design.
- You will remember where to look for more information when you are faced with a distributed system problem.
- Above all, you will learn how to be critical of what you are told by system designers.

Some things an operating system does

- Memory Management
- Scheduling / Resource management
- Communication
- Protection and Security
- File Management - I/O
- Naming
- Synchronization
- User Interface

Progression of Operating Systems

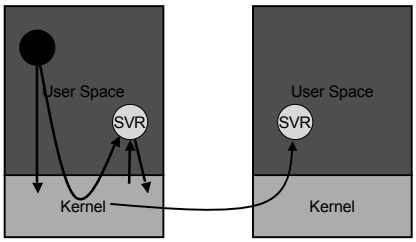
Primary goal of a distributed system:
- Sharing

Progression over past years
- Dedicated machines
- Batch Processing
- Time Sharing
- Workstations and PC's
- Distributed Systems

Structure of Distributed Systems

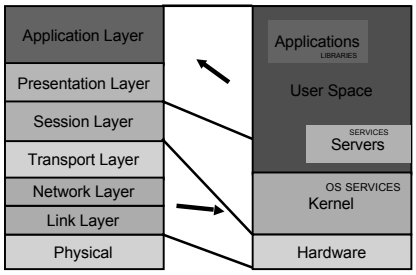
- ❖Kernel
  - Basic functionality and protection
- ❖Application Level
  - Does the real work
- ❖Servers
  - Service and support functions needed by applications
  - Many functions that used to be in Kernel are now in servers.

Structure of Distributed Systems



Network vs. OS Layering

(No direct mapping, colors to stimulate discussion)



Characteristics of a Distributed System

- ❖Basic characteristics:
  - Multiple Computers
  - Interconnections
  - Shared State

Why Distributed Systems are Hard

- ❖Scale:
  - Numeric
  - Geographic
  - Administrative
- ❖Loss of control over parts of the system
- ❖Unreliability of Messages
- ❖Parts of the system down or inaccessible
  - **Lamport:** You know you have a distributed system when the crash of a computer you have never heard of stops you from getting any work done.

End-to-End Argument

- QUESTION: Where to place distributed systems functions?
- Layered system design:
  - Different levels of abstraction for simplicity.
  - Lower layer provides service to upper layer.
  - Very well defined interfaces.

E2E Argument (continued)

- E2E paper argues that functions should be moved closer to the application that uses them.

E2E Argument (continued)

- Rationale:
  - Some functions can only be completely and correctly implemented with application's knowledge.
    - Example:
      - Reliable message delivery, security
      - Encrypted e-mail
      - Streaming media vs. Banking
  - Applications that do not need certain functions should not have to pay for them.

E2E Counter-Argument

- Performance
  - Example: File transfer
    - Reliability checks at lower layers detect problems earlier.
    - Abort transfer and re-try without having to wait till whole file is transmitted.
- Abstraction
  - Less repetition across apps

Bottom line: "spread" functionality across layers.